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Geoarchaeology of Pleistocene open-air sites in the Vila Nova da Barquinha-Santa Cita area (Lower Tejo River basin, central Portugal)

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ABSTRACT

This paper aims to provide insight into human occupation and landscape change during the Pleistocene in a central area of the Lower Tejo basin (Portugal). Detailed geomorphological mapping, coupled with lithostratigraphy, sedimentology and luminescence dating, supports the identification of a complete terrace staircase sequence. It consists of six gravely terraces located below the culminant (Pliocene) basin unit. A chronological framework for the sedimentary sequences and associated human industries is proposed and correlated with marine oxygen isotope stages (MIS): T1 terrace, not dated; T2, not dated; T3, >300 ka; T4, ~300–160 ka (MIS8, MIS7 and MIS6); T5, ~136–75 ka (MIS5); T6, ~62–30 ka (MIS3); colluvium and aeolian sands, ~30–14 ka (MIS2); valley fill deposits, ~14 ka to present (MIS1). The oldest artefacts were found at the base of the T4 terrace, with the local stratigraphic level dated to $\geq 175 \pm 6$ ka (Middle Pleistocene). The lithic assemblages collected from distinct stratigraphic levels (T4, T5 top, T6 terraces and colluvium) are characterized by the predominance of opportunistic technological choices, a feature that can be attributed partly to the preferential exploitation of the available raw material, dominated by local-sourced quartzites and quartz pebbles. The adaptation to local raw material (texture and volume), together with subsistence patterns and behaviours, could explain the rarity of Acheulian types (handaxes and cleavers) and picks in the T4 terraces of the Tejo tributaries; this is in contrast to the same terrace of the Tejo valley, in which these types are found. Interpretation of the environmental conditions (controlled by climate and glacio-eustatic sea-level changes) affecting the hunter-gatherer human groups is also presented.

1. Introduction

The Iberian Peninsula is influenced by both the Atlantic and Mediterranean domains. Pleistocene fluvial terrace sequences are well developed in most of the major river systems in Iberia, with many of them driven by climate changes, although tectonic and sea-level effects can also be observed (Bridgland and Westaway, 2007; Santisteban and Schulte, 2007).

The ~1100 km long Tejo River originates in central-eastern Spain at an altitude of 1839 m and has a catchment area of 81,947 km^2 with a present average flow of ~17,253 Hm^3 yr^{-1} (Benito et al., 2003). In the Portuguese sector the catchment comprises ~25,000 km^2 and the river is 230 km long, with a mean gradient of 0.03%. Today the river is characterized by extreme seasonal and annual flow variability, with peak discharges more than 30 times the average discharge (Benito et al., 2003; Bettencourt and Ramos, 2003). The Tejo drains two Cenozoic basins (the Madrid and the Lower Tejo basins, respectively) towards the west and southwest. Its mouth, at the Atlantic Ocean, is located near Lisboa (central western Portugal). The Lower Tejo valley provides a long record (ca. 3.4 Ma) of alluvial and cultural history, from which it is possible to interpret landscape development, environmental changes and human occupation, all influenced by base-level and climate changes (Cunha et al., 2005, 2008).

In the Lower Tejo basin, the aggradational terraces consist mainly of coarse-grained siliciclastic gravels and sands (Cunha

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